US EPA RECORDS CENTER REGION 5
487768

HYDROGEOLOGICAL STUDY

FOR

TRW, INC.

PORTLAND, MICHIGAN

FISHBECK, THOMPSON, CARR & HUBER, INC.

CONSULTING ENGINEERS

LANSING, MICHIGAN

GRAND RAPIDS, MICHIGAN

HYDROGEOLOGICAL STUDY

FOR

TRW, INC.

PORTLAND, MICHIGAN

RECEIVED
APR 23 1982
DISTRICT 3
WATER QUALITY DIV.

April, 1982

Project No. 81850/109-29

Prepared by:

Fishbeck, Thompson, Carr & Huber, Inc.
1500 East Beltline, S.E.
Grand Rapids, Michigan 49506

FISHBECK, THOMPSON, CARR & HUBER, INC.

CONSULTING ENGINEERS

AFFILIATED COMPANIES
Alpha Lab Inc.
Walter W. Meinert, P.E.
Groundwater Hydrologist

PRINCIPALS
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Charles D. Carr, P.E.
Carl V. Huber, P.E.
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Walter W. Meinert, P.E.
ASSOCIATES
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James D. Townley, P.E.
Forrest Winchester, P.E.
William A. Johnson, R.L.S.
Peter D. Beaver, R.L.S.

April 22, 1982
Project No. 81850/112-55

Mr. Keith Patterson
Manager Industrial Relations
TRW, Inc.
902 Lyons Road
Portland, MI 49975

Dear Mr. Patterson:

Re: Hydrogeological Study

We are pleased to report that the hydrogeological study conducted at your plant has been completed. This study was initiated to supplement an application for a groundwater discharge permit.

The procedure used in this study and the resulting conclusions are contained within the report.

Our staff is available at your convenience to discuss this report and any questions prompted by it.

Respectfully submitted,

FISHBECK, THOMPSON, CARR & HUBER, INC.

Forrest Winchester

Forrest Winchester, P.E.

Walter Meinert

Walter Meinert, P.E.

jds

Enclosure

BACKGROUND

This hydrogeological study was prepared as part of the groundwater discharge permit application submitted by TRW, Inc., Portland, Michigan. Data and information concerning the hydrogeological environment of the area will be evaluated in order to assess the existing and future impact of the discharge.

The TRW site occupies approximately 124 acres in Ionia County (T6N R5W) and is bordered by Lyons Road to the west and the Grand River to the north and east. The north Portland city limit bisects the property. A map of the entire site has been included in Appendix A.

A groundwater discharge permit is being requested for the discharge of treated process wastewater. The process wastewater from the plant contains soluble oil coolants which are skimmed of free oils, treated with ferric chloride, solids settled in a clarifier and the effluent discharged to the ponds. There are three ponds in series from which there is some minor amount of seepage. Ultimately the water is discharged to a marshy area at the north end of pond No. 3. This pond system has been in use since the early 1960's.

GENERAL GEOLOGY

A review of the surface formation map of Michigan indicates that the local geology consists primarily of spillway type sands which were originally deposited along the banks of the present Grand River. Spillway type sands are generally considered to be fine grained and exhibit favorable permeabilities. The favorable hydraulic properties are primarily the result of the depositional environment, which was controlled by glacial meltwater action. The driller's logs, contained herewith, confirms the local geology.

The surface formation map further indicates the area immediately west of the seepage ponds to consist of glacial till. This area comprises the higher elevations beyond the westerly limits of the river flood plain. Glacial till is the result of direct deposition by the ice sheet and contains a heterogeneous mixture of sand, gravel, and clay. We sometimes find areas of cleaner granular materials within the glacial till. Boring No. 1 has revealed approximately 25 feet of saturated granular materials within the till at this site.

HYDROGEOLOGY

The Stearns Drilling Company, Dutton, Michigan was contracted to drill four observation/monitor wells in November 1981. The borings were drilled using a hollow stem auger and finished in permeable granular materials. Two-inch diameter galvanized steel well casings were installed and completed with stainless steel well screens. To prevent the intrusion of surface water through the annular space between the bore hole and well casing, this annulus was grouted with bentonite clay.

The location of each monitoring well was established by surveying. The elevations of the top of the well casings and the ground surface were also established by survey methods, to USGS datum. The depths of the groundwater surface were measured to the nearest .01 foot with the use of a chalked tape. The locations and corresponding elevations of the wells in relation to the seepage ponds are shown on figure No. 1. The boring logs and soil formation types encountered were accurately recorded by the driller and have been included in Appendix B.

A review of the water level elevations within the monitoring wells and at the Grand River leads us to conclude that the average hydraulic gradient is .3 percent towards the northeast and the river. A potentiometric surface map has been prepared and is included in Appendix A. This presentation provides the determination of the hydraulic gradient of the groundwater surface and also confirms the direction of groundwater movement. This movement is in the direction perpendicular to the water surface contours. A review of water level data supports the effect of the Grand River upon the hydraulic gradient and direction of groundwater movement.

Well No. 1 is located upgradient of the seepage ponds and therefore can be used to determine the local background groundwater quality. Well Nos. 1, 3 and 4 were screened at a depth of 25 feet below the water level. To allow for future sampling at two different elevations, well No. 2 was screened at a depth of 20 feet below the water surface. During well installation, water samples were collected at several depths as the borings were deepened. This vertical sampling would provide information on any change in groundwater quality due to the stratification of soil types.

The driller's logs do not reveal any subsurface stratification and suggests a uniform groundwater flow through the area. This hydrologic environment would promote the ready movement of a contaminant from beneath the lagoons toward the Grand River. Due to the absence of a degraded groundwater condition downgradient from the lagoons, it appears that no contaminants have entered the groundwater.

WATER QUALITY

In November, 1981 three water samples, from varying depths, were collected per well. Well Nos. 1 and 4 were resampled in April 1982. All samples were analyzed by Alpha Lab, Inc. of Grand Rapids. The suspended solids in the samples were allowed to settle and the analyses were performed on the decanted supernatant. The results of all lab analyses have been included in Appendix C.

The background groundwater quality meets all primary and secondary drinking water standards except for iron. Samples from the monitoring wells downgradient from the ponds, show virtually no change in groundwater quality. Initially, well No. 4 had shown a higher than normal concentration of oil and grease. However, resampling of the well has shown that all four wells contain about the same relatively low levels of oil and grease.

GROUNDWATER MONITORING PROGRAM

The four existing monitoring wells may be used for any future sampling requirements of groundwater quality and water level elevations. The permanent depths of the monitoring wells will provide for the monitoring of groundwater quality, both in an upgradient and downgradient direction, at the same depth. The water quality may also be monitored at a shallow depth within well No. 2. This arrangement will provide for the detection of any future stratification of water quality downgradient from the lagoons.

A portable hand pump can be used to collect the samples. To prevent the entrance of contaminants the wells should remain capped.

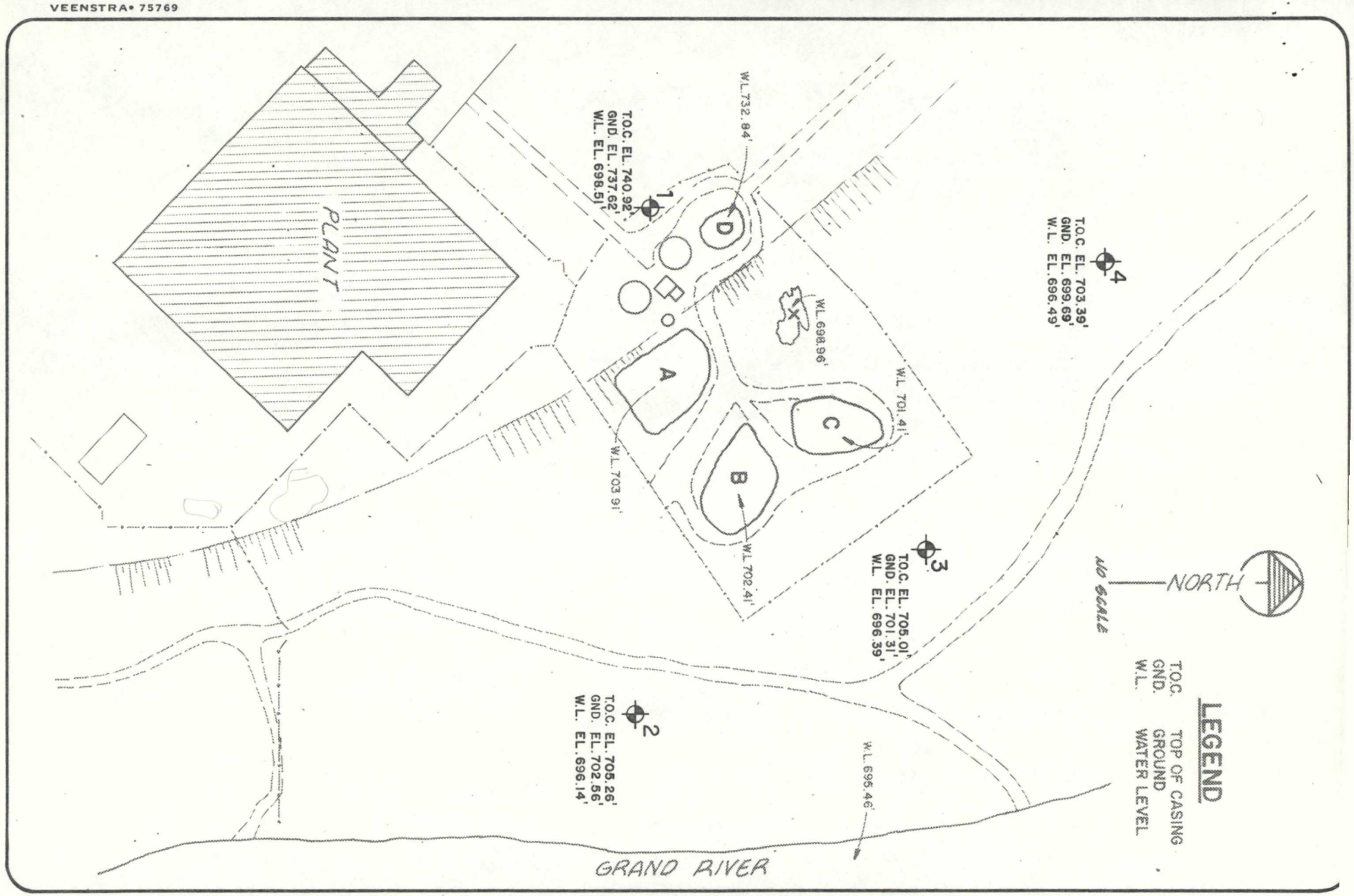
CONCLUSIONS AND RECOMMENDATIONS

Our review of the information obtained from the monitoring wells indicates that the direction of groundwater flow is controlled by the Grand River. The TRW site is bordered by the Grand River to the north and east. Groundwater quality data indicates that the operation of the seepage lagoons has resulted in no adverse impact upon the underlying groundwater. Furthermore, there are no potable water wells situated between the lagoons and the river. The potential impact of the lagoons upon any off-site potable well appears to be non-existant.

Provided the characteristics of the plants waste discharge to the ponds does not change significantly, the continued operation of this system can be expected to cause little to no effect upon the local groundwater.

APPENDIX A

VEENSTRA• 75769



A1

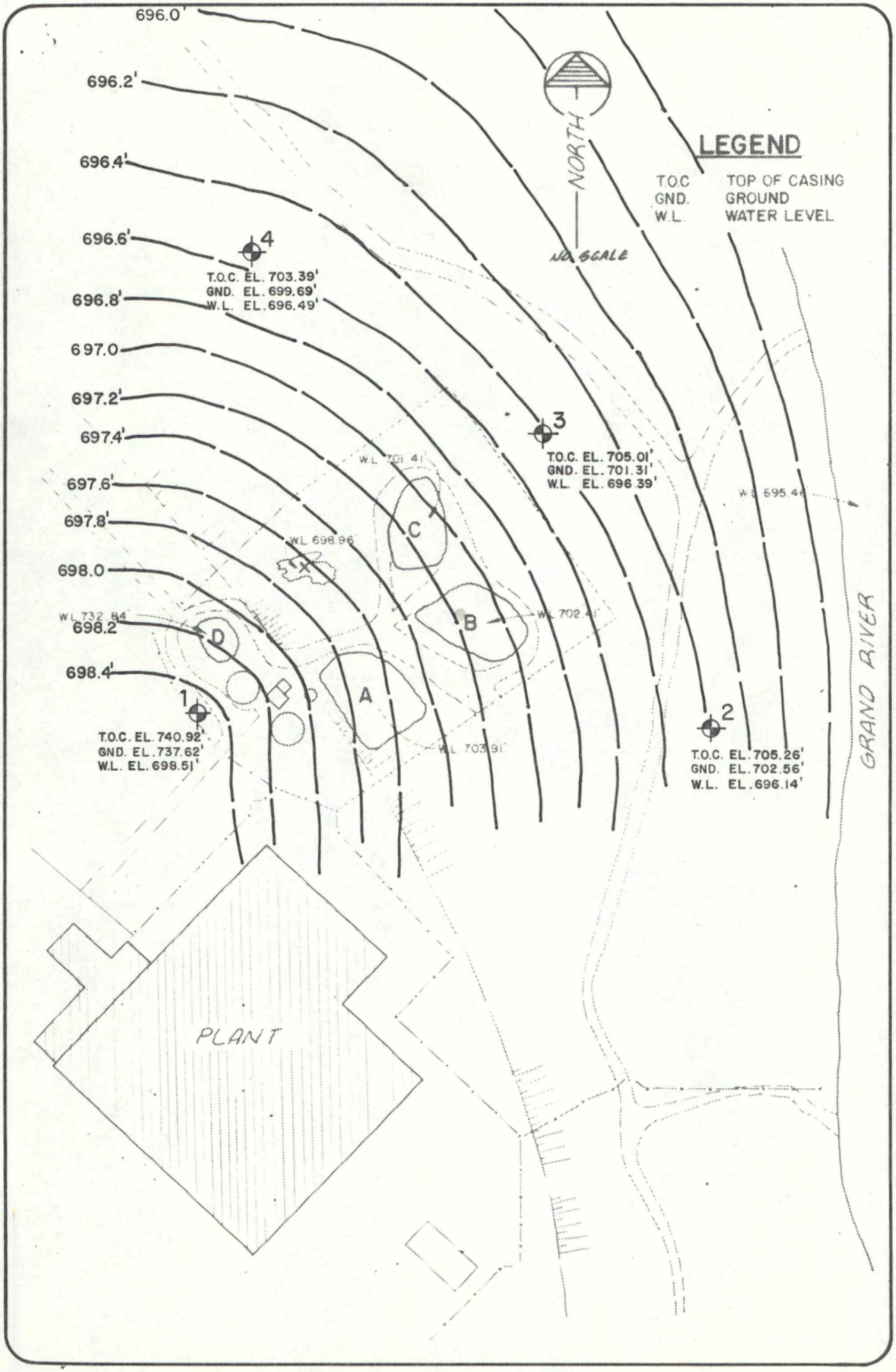
PROJECT NO. 81850
FIGURE NO.

T. R. W.
HYDROGEOLOGICAL STUDY

FISHBECK-THOMPSON CARR & HUBER, INC.
CONSULTING ENGINEERS
820 N. WASHINGTON AVE. LANSING, MICHIGAN
1500 EAST BELTLINE S.E. GRAND RAPIDS, MICHIGAN

NO.	REVISIONS	BY	DATE

Drawn By D.U.
Date 4-82
Approved By W.M.
Date 4-82



NO	REVISIONS	BY	DATE

Drawn By D.U. Date 4-82
Approved By W.M. Date 4-82

FISHBECK-THOMPSON CARR & HUBER, INC.
CONSULTING ENGINEERS
1500 EAST BELTLINE S.E. GRAND RAPIDS MICHIGAN
820 N. WASHINGTON AVE. LANSING, MICHIGAN

T.R.W.
HYDROGEOLOGICAL STUDY

PROJECT NO. 81850
FIGURE NO. A2

VEENSTRA • 75769

APPENDIX B

STEARNS DRILLING
Industrial Park Drive
Dutton, Michigan 49511
616/698-7770

LOG OF TEST BORING NO. 1
Sheet 1 of 2
Project T.R.W.

Location Portland, MI

Job No. E 684-11
Permit No.

BORING LOCATION
Inside fence 70' N. of gate that goes to sludge tanks 6' E. off fence line.

Surface Elev.

Date Started 11-12-81
Date Completed 11-12-81

Crew Chief Tom Skipper

Drill Rig 45C
Boring Method Hollow Auger

Hole plugged with Bentonite

Groundwater:
Encountered at 39' ft.
After Completion 39.5' ft.
After ____ hrs; ____ ft.
Volume
Seepage at ____ ft.
Boring Caved in at 9.5' ft.

LEGEND:
"N" - Standard Penetration Resistance
S.S. - 2" O.D.Split Spoon Sample
L.S. - Sectional Liner Sample
S.T. - Shelby Tube Sample
P. - Pocket Penetrometer
S.N.R. - Sample Not Recovered

REMARKS:

Sample Type	REC	Blow Count	Depth in Feet	SOIL DESCRIPTION	Unified Soil Classif.
			0	Topsoil-Black	
				Coarse gravel & stones w/clay binder	
			5		
				Brown fine to medium sand occasional coarse sand	
			10		
				Brown fine sand	
			15		
				Brown fine sand & gravel & cobbles	
			20		
			25		
				Brown medium to coarse sand w/gravel, trace clay	
			30	(continued on next page)	

STEARNS DRILLING
Industrial Park Drive
Dutton, Michigan 49511
616/698-7770

LOG OF TEST BORING NO. 1

Sheet 2 of 2

Project T.R.W.

Location Portland, MI

Job No. E 684-11

Permit No.

BORING LOCATION

Inside fence 70' N. of gate that goes to sludge tanks 6' E. off fence line

Surface Elev.

Date Started 11-12-81

Date Completed 11-12-81

Crew Chief Tom Skipper

Drill Rig 45C

Boring Method Hollow Auger

Hole plugged with Bentonite

Groundwater:
Encountered at 39' ft.
After Completion 39.5 ft.
After hrs; ft.
Volume
Seepage at ft.
Boring Caved in at 9.5' ft.

LEGEND:
"N" - Standard Penetration Resistance
S.S. - 2" O.D.Split Spoon Sample
L.S. - Sectional Liner Sample
S.T. - Shelby Tube Sample
P. - Pocket Penetrometer
S.N.R. - Sample Not Recovered

REMARKS:

Sample Type	REC	Blow Count	Depth In Feet	(cont.) SOIL DESCRIPTION	Unified Soil Classif.
				Brown medium to coarse sand w/gravel	
			35		
			40	Note: Water samples taken at 45' to 48' and 60' to 63' Screen set permanently at 62.5' to 65.6' anddeveloped Screen-1.25"x36" 7 slot stainless Pipe-2" galvanized - 3.5' above ground	
			45		
			50		
			55		
				Gravel w/occasional stone	
			60		
				End of boring @ 65.0'	

STEARNS DRILLING
Industrial Park Drive
Dutton, Michigan 49511
616/698-7770

LOG OF TEST BORING NO. 2

Sheet 1 of 1

Project T.R.W.

Location Portland, MI

Job No. E 684-11

Permit No.

BORING LOCATION

Approximately 700' off East side of T.R.W. building or 40' E. of service road.

Surface Elev.

Date Started 11-11-81

Date Completed 11-11-81

Crew Chief Tom Skipper

Drill Rig 45C

Boring Method Hollow Auger

Hole plugged with Bentonite

Groundwater:
Encountered at 8 ft.
After Completion 6 ft.
After ____ hrs; ____ ft.
Volume
Seepage at ____ ft.
Boring Caved in at 6' ft.

LEGEND:
"N" - Standard Penetration Resistance
S.S. - 2" O.D.Split Spoon Sample
L.S. - Sectional Liner Sample
S.T. - Shelby Tube Sample
P. - Pocket Penetrometer
S.N.R. - Sample Not Recovered

REMARKS:

Sample Type	REC	Blow Count	Depth in Feet	SOIL DESCRIPTION	Unified Soil Classif.
			0	Topsoil-Brown gravely	
				Brown coarse sand & gravel w/clay binder	
			5	Brown fine to medium sand w/gravel & stones	
				(wet)	
			10	Light brown fine to medium sand	
				Note: Water samples taken at 19' to 21' and 29' to 31'	
			15	Screen set permanently at 7.5' to 10.5' and developed	
				Screen-1.25"x36" 7 slot stainless	
				Pipe- 2" galvanized - 2.5' above ground	
			20		
			25		
			30	End of boring @ 30.0'	

STEARNS DRILLING
Industrial Park Drive
Dutton, Michigan 49511
616/698-7770

LOG OF TEST BORING NO. 3

Sheet 1 of 1

Project T.R.W.

Location Portland, MI

Job No. E 684-11

Permit No.

BORING LOCATION

Approximately 800' off N.E. corner of T.R.W. building or 20' E. of pond service trail

Surface Elev.

Date Started 11-11-81

Date Completed 11-11-81

Crew Chief Tom Skipper

Drill Rig 45C

Boring Method Hollow Auger

Hole plugged with Bentonite

Groundwater:
Encountered at 7' ft.
After Completion 5' ft.
After ____ hrs; ____ ft.
Volume
Seepage at ____ ft.
Boring Caved in at 3.5' ft.

LEGEND:
"N" - Standard Penetration Resistance
S.S. - 2" O.D.Split Spoon Sample
L.S. - Sectional Liner Sample
S.T. - Shelby Tube Sample
P. - Pocket Penetrometer
S.N.R. - Sample Not Recovered

REMARKS:

Sample Type	REC	Blow Count	Depth in Feet	SOIL DESCRIPTION	Unified Soil Classif.
			0	Top	
				Coarse gravel & stones w/sandy clay binder	
			5	Medium to coarse sand & gravel trace clay	
				(wet)	
			10		
				Brown fine to medium sand	
			15		
			20	Note: Water samples taken at 12' to 15' and 22' to 25'	
				Screen set permanently at 32' to 35' and developed. Screen-1.25"x36" 7 slot stainless Pipe-2" galvanized-4'above ground.	
			25		
			30	End of boring @ 35.0'	

STEARNS DRILLING
Industrial Park Drive
Dutton, Michigan 49511
616/698-7770

LOG OF TEST BORING NO. 4

Sheet 1 of 1

Project T.R.W.

Location Portland, MI

Job No. E 684-11

Permit No.

BORING LOCATION

Approximately 700' N.E. from treatment ponds or 15' off servoce trail next to big tree

Surface Elev.

Date Started 11-12-81

Date Completed 11-12-81

Crew Chief Tom Skipper

Drill Rig 45C

Boring Method Hollow Auger

Hole plugged with Bentonite

Groundwater:
Encountered at 4.5' ft.
After Completion 3.5' ft.
After ____ hrs; ____ ft.
Volume
Seepage at ____ ft.
Boring Caved in at 3.5 ft.

LEGEND:
"N" - Standard Penetration Resistance
S.S. - 2" O.D.Split Spoon Sample
L.S. - Sectional Liner Sample
S.T. - Shelby Tube Sample
P. - Pocket Penetrometer
S.N.R. - Sample Not Recovered

REMARKS:

Sample Type	REC	Blow Count	Depth In Feet	SOIL DESCRIPTION	Unified Soil Classif.
				Topsoil-Black organic (peat)	
			5	Dark brown sandy peat (wet)	
			10	Brown very fine to fine sand occasional stone	
			15		
				Brown fine to coarse sand fine gravel w/shell fragments	
			20	Gravel	
				Note: Water samples taken at 9'to11' and 19'to 21'	
			25	Screen set permanently at 27'to30' and developed. Screen-1.25"x36" 7 slot stainless Pipe-2" galvanized-4' above ground.	
			30	End of boring @ 30.0'	

APPENDIX C

Alpha Lab Environmental Laboratory

TRW

November 30, 1981
Project No. 13680
Date Received: 11/13/81

	Well #1 44'-47' 11/12/81	Well #1 54'-57' 11/12/81	Well #1 62.5'-65.5' 11/12/81	Well #2 8'-11' 11/11/81	Well #2 19'-21' 11/11/81	Well #2 29'-31' 11/11/81
Alkalinity	220 mg/l	260 mg/l	260 mg/l	250 mg/l	240 mg/l	240 mg/l
Chemical Oxygen Demand	16 mg/l	16 mg/l	8 mg/l	<4 mg/l	36 mg/l	<4 mg/l
Chloride	3.6 mg/l	5.2 mg/l	5.6 mg/l	13 mg/l	9.6 mg/l	12 mg/l
Calcium	61 mg/l	60 mg/l	4.7 mg/l	4.6 mg/l	4.8 mg/l	4.8 mg/l
Chromium Total	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Copper	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Conductivity	550 umhos	600 umhos	600 umhos	650 umhos	650 umhos	600 umhos
Iron	1.0 mg/l	1.1 mg/l	0.18 mg/l	0.40 mg/l	0.26 mg/l	0.19 mg/l
Magnesium	28 mg/l	28 mg/l	32 mg/l	33 mg/l	32 mg/l	33 mg/l
Nickel	0.04 mg/l	0.04 mg/l	0.04 mg/l	0.06 mg/l	0.04 mg/l	0.02 mg/l
Oil and Grease	7.3 mg/l	4.0 mg/l	6.3 mg/l	3.3 mg/l	4.7 mg/l	8.3 mg/l
pH	7.5	7.4	7.0	7.1	7.3	7.0
Sodium	28 mg/l	15 mg/l	10 mg/l	12 mg/l	24 mg/l	10 mg/l
Sulfate	250 mg/l	175 mg/l	45.5 mg/l	65 mg/l	205 mg/l	50 mg/l
Total Organic Carbon	12 mg/l	<4 mg/l	10 mg/l	<4 mg/l	10 mg/l	10 mg/l
Zinc	1.2 mg/l	5.3 mg/l	1.40 mg/l	0.30 mg/l	0.15 mg/l	0.08 mg/l
Lab No.	452	453	454	455	456	457

This report is accurate and true to the best of my ability and in accordance to procedures described in "Standard Methods for the Examination of Water and Wastewater," 14th Edition, and "EPA Methods for Chemical Analysis of Water and Wastes," March, 1979.

M. Winchester Jr.
Michael Winchester, Chemist

jds

1500 East Beltline, Grand Rapids, Michigan 49506 (616) 949-0751

Alpha Lab Environmental Laboratory

TRW

November 30, 1981
Project No. 13680
Date Received: 11/13/81

	Well #3 12'-15' 11/11/81	Well #3 22'-25' 11/11/81	Well #3 32'-35' 11/11/81	Well #4 9'-11' 11/12/81	Well #4 19'-21' 11/12/81	Well #4 27'-30' 11/12/81
Alkalinity	250 mg/l	310 mg/l	240 mg/l	260 mg/l	250 mg/l	270 mg/l
Chemical Oxygen Demand	10 mg/l	30 mg/l	12 mg/l	34 mg/l	4 mg/l	8 mg/l
Chloride	16 mg/l	30 mg/l	23 mg/l	27 mg/l	9.0 mg/l	6.4 mg/l
Calcium	4.9 mg/l	4.7 mg/l	4.9 mg/l	5.0 mg/l	66 mg/l	72 mg/l
Chromium Total	<0.02 mg/l	<0.02 mg/l	0.03 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Copper	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Conductivity	650 umhos	800 umhos	700 umhos	650 umhos	600 umhos	500 umhos
Iron	0.38 mg/l	1.2 mg/l	0.28 mg/l	0.26 mg/l	0.53 mg/l	0.32 mg/l
Magnesium	25 mg/l	32 mg/l	30 mg/l	28 mg/l	29 mg/l	34 mg/l
Nickel	0.02 mg/l	0.03 mg/l	0.03 mg/l	0.04 mg/l	0.03 mg/l	0.03 mg/l
Oil and Grease	5.7 mg/l	6.7 mg/l	3.7 mg/l	26.7 mg/l	28 mg/l	3.3 mg/l
pH	7.5	7.4	7.5	7.7	7.4	7.4
Sodium	17 mg/l	36 mg/l	17 mg/l	35 mg/l	12 mg/l	8.2 mg/l
Sulfate	80 mg/l	42 mg/l	72 mg/l	77 mg/l	77 mg/l	77 mg/l
Total Organic Carbon	<4 mg/l	12 mg/l	<4 mg/l	10 mg/l	<4 mg/l	<4 mg/l
Zinc	0.07 mg/l	2.3 mg/l	0.42 mg/l	0.54 mg/l	0.48 mg/l	0.24 mg/l
Lab No.	458	459	460	461	462	463

This report is accurate and true to the best of my ability and in accordance to procedures described in "Standard Methods for the Examination of Water and Wastewater," 14th Edition, and "EPA Methods for Chemical Analysis of Water and Wastes," March, 1979.

M. Winchester

Michael Winchester, Chemist

jds

1500 East Beltline, Grand Rapids, Michigan 49506 (616) 949-0751

Alpha Lab Environmental Laboratory

TRW
FTCH #81850

April 15, 1982
Project No. 13680
Date Received: 4/7/82

	Well #1 4/7/82	Well #4 4/7/82
Oil and Grease	-	<0.2 mg/l
Sulfate	80 mg/l	-
Zinc	0.24 mg/l	-
Lab. No.	601	602

This report is accurate and true to the best of my ability and in accordance to procedures described in "Standard Methods for the Examination of Water and Wastewater," 15th Edition, and "EPA Methods for Chemical Analysis of Water and Wastes," March, 1979.

Michael Winchester, Chemist

lk

1500 East Beltline, Grand Rapids, Michigan 49506 (616) 949-0751

APPENDIX D

FISHBECK, THOMPSON, CARR & HUBER, INC.

CONSULTING ENGINEERS

PRINCIPALS
J. Paul Thompson, Jr., P.E.
Charles D. Carr, P.E.
Carl V. Huber, P.E.
Bruce K. Elenbaas, P.E.
ASSOCIATES
Thomas A. Doane, P.E.
Michael L. Peters, P.E.
James D. Townley, P.E.
Forrest Winchester, P.E.
William A. Johnson, R.L.S.
Peter D. Beaver, R.L.S.

September 14, 1981
Project No. 81999/89-71

Mr. Jim Turek
Water Quality Specialist
Department of Natural Resources
State Office Building
350 Ottawa Avenue, N.W.
Grand Rapids, MI 49502

Dear Jim:

Re: Hydrogeo Study - TRW, Inc., Portland, Michigan

The purpose of this study will be to fulfill the requirements for the groundwater discharge permit application for the TRW plant in Portland, Michigan.

In order to complete this hydrogeological study, we propose to drill a total of four observation holes. These holes will be on the TRW property. The borings will be made with hollow stem augers. The well casings will be two-inch galvanized pipe, and each monitoring well will have a stainless steel well screen. Provisions will be made within each monitoring well to prevent the intrusion of surface water between the well casing and the bore hole. Each well screen will be developed either by compressed air or hydraulic jetting to insure a functional source for groundwater monitoring. These wells will be capped and left in place for future monitoring requirements.

On the enclosed site plan, the locations of the borings are indicated 1 through 4. The wells are anticipated to be drilled to a depth of 20 feet to 25 feet. Water samples from the wells will be collected at 5 feet under the water surface, 10 feet under the water surface, and 20 feet under the water surface in well No. 2; 5 feet, 15 feet and 25 feet under the water surface in well Nos. 1, 3, and 4. Well No. 2 will be at a shallower depth so that we will have permanent observation wells at two different elevations.

None of the borings will be finished in clay. If clay is encountered at the shallow depths, we will consider investigating the thickness and characteristics of the clay at that time in the field. Split spoon samples will be collected at several locations if further investigation is necessary. The final depth of the proposed monitoring wells will be determined in the field depending upon the types of soils which are found during the drilling operation.

Twelve groundwater samples will be collected at the time of drilling and analyzed for the following parameters:

NATURAL RESOURCES COMMISSION
JACOB A. HOEFER
CARL T. JOHNSON
E. M. LAITALA
HILARY F. SNELL
HARRY H. WHITELEY
JOAN L. WOLFE
CHARLES G. YOUNGLOVE

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

HOWARD A. TANNER, Director

State Office Building
350 Ottawa Avenue, N. W.
Grand Rapids, Michigan 49503

...CEIVED
...1981
...THOMPSON,
...AND HUBER

October 29, 1981

Mr. Forrest Winchester, P. E.
Mr. Walter W. Meinert, P. E.
Fishbeck, Thompson, Carr and Huber, Inc.
1500 East Beltline, S. E.
Grand Rapids, Michigan 49506

Subject: Hydrogeological Study Plan for TRW, Inc., Portland

Dear Messrs. Winchester and Meinert:

This will confirm receipt of the hydrogeological study plan for TRW, Inc. dated September 14, 1981. The study will be conducted and a report submitted as part of the company's State Discharge Permit application as required by the Part 22 Rules. Please be advised that the plan is approvable with the following conditions:

1. An upgradient well is needed for determining background water quality and static water level. Therefore, either a fifth well location needs to be established or the four proposed well locations need to be shifted and an upgradient well established.

2. The sampling program listed in the plan is approvable as an initial effort. However, additional samples may be required to define any ground water contamination if encountered.

3. The final report should contain recommendations for any additional work and for long-term ground water monitoring, which is a standard requirement of discharge permits. The optimal screen depth for long-term monitoring should be specified. We will require that the wells be reset at this depth and monitored on a quarterly basis for the life of the permit.

4. A six-month period between data collection and final report is acceptable only if we receive a laboratory report of the well samples as soon as it is available.

MICHIGAN
THE GREAT LAKE STATE
R1026-1 1/79

The field work may begin immediately if the study incorporates the above conditions. On the other hand, if you wish to discuss this proposal further, feel free to call.

Yours truly,

WATER QUALITY DIVISION

Mike Beck,
Assistant District Engineer

MB/JMT/mc
cc: Keith Paterson, TRW, Portland
W.Q.D. Files, Lansing

FW

FISHBECK, THOMPSON, CARR & HUBER, INC.

CONSULTING ENGINEERS

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November 3, 1981
Project No. 81850/92-48

Mr. Mike Beck
Assistant District Engineer
Department of Natural Resources
State Office Building
350 Ottawa
Grand Rapids, MI 49503

Dear Mike:

Re: Hydrogeological Study Plan for TRW, Inc., Portland, MI

In response to your letter of October 29, 1981:

1. We will shift the four well locations, see Figure 1, so that there is a well in a more upgradient position.

2. The wells will remain so that any additional samples can be collected as required.

3. Our final report will contain recommendations for any additional work and long-term monitoring which will include the optimal screen depth of the wells.

4. We will supply the laboratory results of the well samples as soon as they are available.

We plan to have the drilling contractor on site the week of November 9, 1981 to install the monitoring wells. The completed hydrogeological report and the permit application will be submitted to your office by April 23, 1982.

If you have any questions or need further information, please contact us.

Very truly yours,

FISHBECK, THOMPSON, CARR & HUBER, INC.

Forrest Winchester

Forrest Winchester, P.E.

lk

Enclosure

cc: Mr. Keith Patterson

calcium	total chromium
sodium	copper
magnesium	nickel
chloride	zinc
sulfate	oil and grease
bicarbonate	iron
pH	specific conductance
chemical oxygen demand	total organic carbon

The top of each well casing will be surveyed to U.S.G.S. datum, and the water levels in each well will be recorded in U.S.G.S. datum.

All of the above data will be combined in a report which will include a location and site map, the boring logs of the observation holes, groundwater quality, direction of groundwater flow, and if possible the hydraulic gradient, and any evaluation as to the extent of any contaminated groundwater.

Our plan will be to start the field work within two weeks after receiving your final approval of this plan. We anticipate our field work can be completed within one week. Our laboratory analysis of the water samples can be completed within three weeks after receiving the samples, and our final report can be completed within six months after the field work has been completed.

If you have any questions or comments, please contact us.

Very truly yours,

FISHBECK, THOMPSON, CARR & HUBER, INC.

Forrest Winchester

Forrest Winchester, P.E.

Walter Meinert

Walter W. Meinert, P.E.

jds

Enclosures

cc: Mr. Keith Patterson